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(56) Documents Cited
GB 2228127 A GB 2216703 A GB 2191323 A
GB 1459325 A EP 0590493 A1 EP 0504491 A1
US 5640627 A
Patent abstracts of Japan Vol. 16, No. 404, P1410 page 27 &JP4134493

(58) Field of Search
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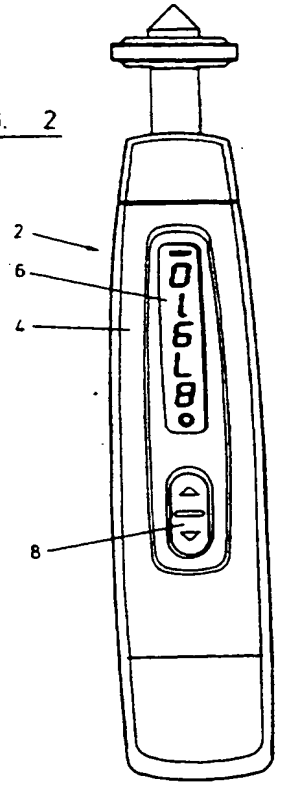
(54) **Display device**

(57) A display device (6) in which the displayed characters can be inverted or rotated with respect to the instrument (2) upon which the display is mounted by pressing a switch (8) or under computer or other control. Also disclosed is a multi-segment display element (Fig. 4). Advantage is to allow user of the instrument to change the character orientation for ease of viewing.

FIG. 2



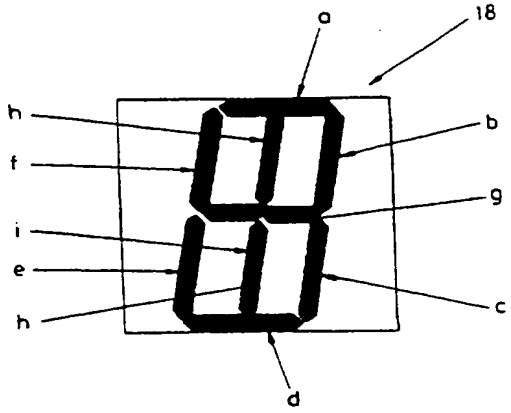


FIG. 4

GB 2 317 489 A

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1995

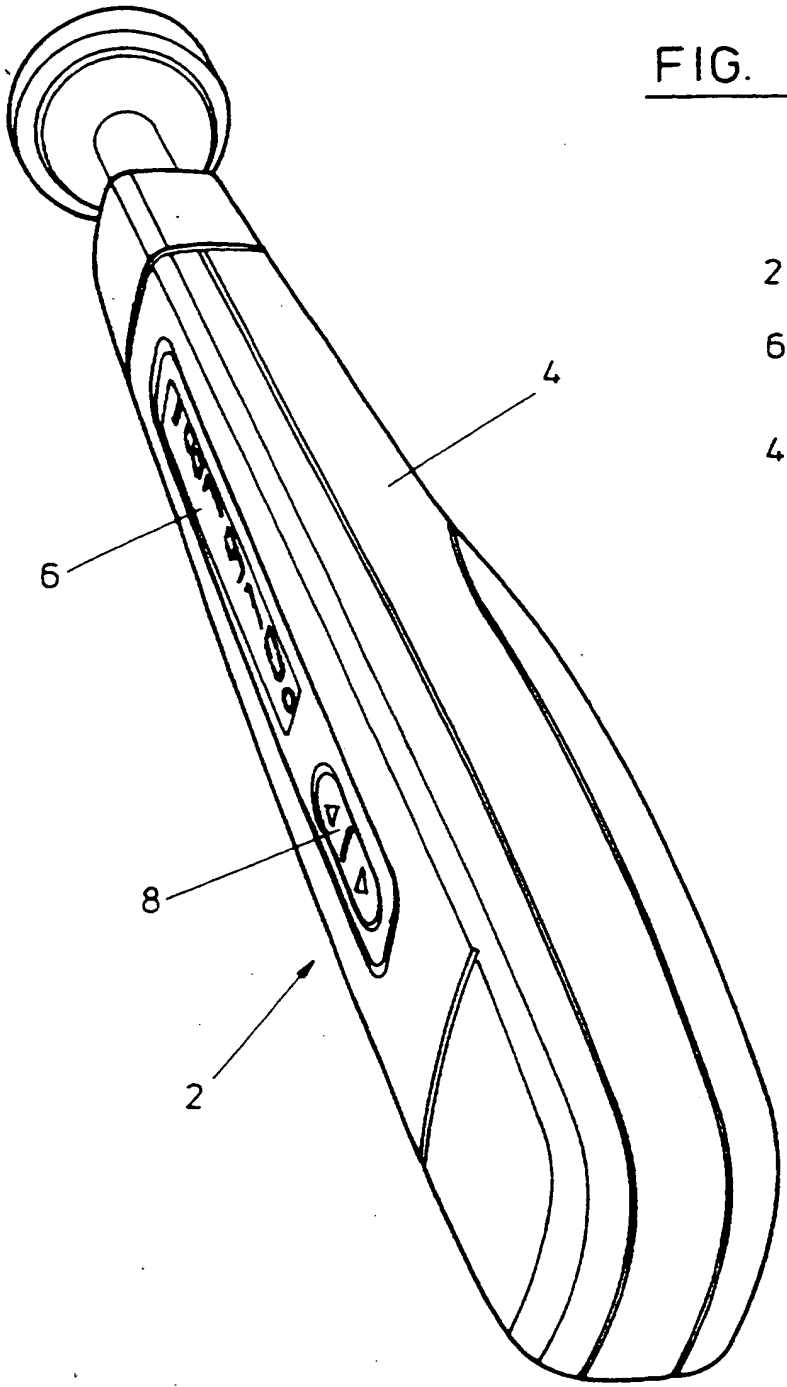


FIG. 1

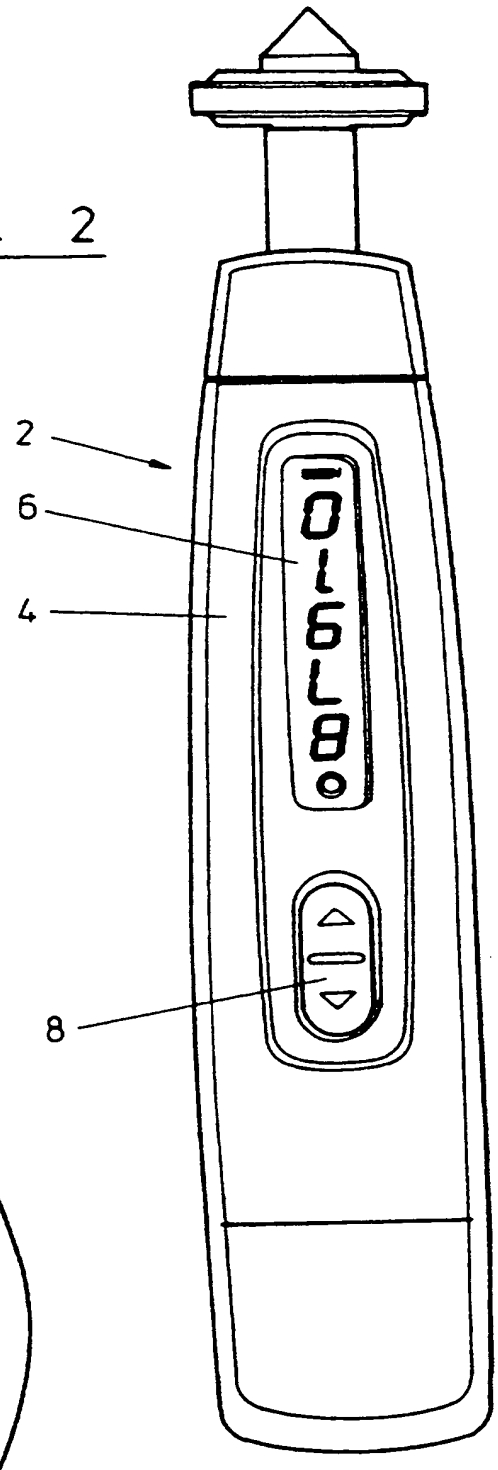


FIG. 2

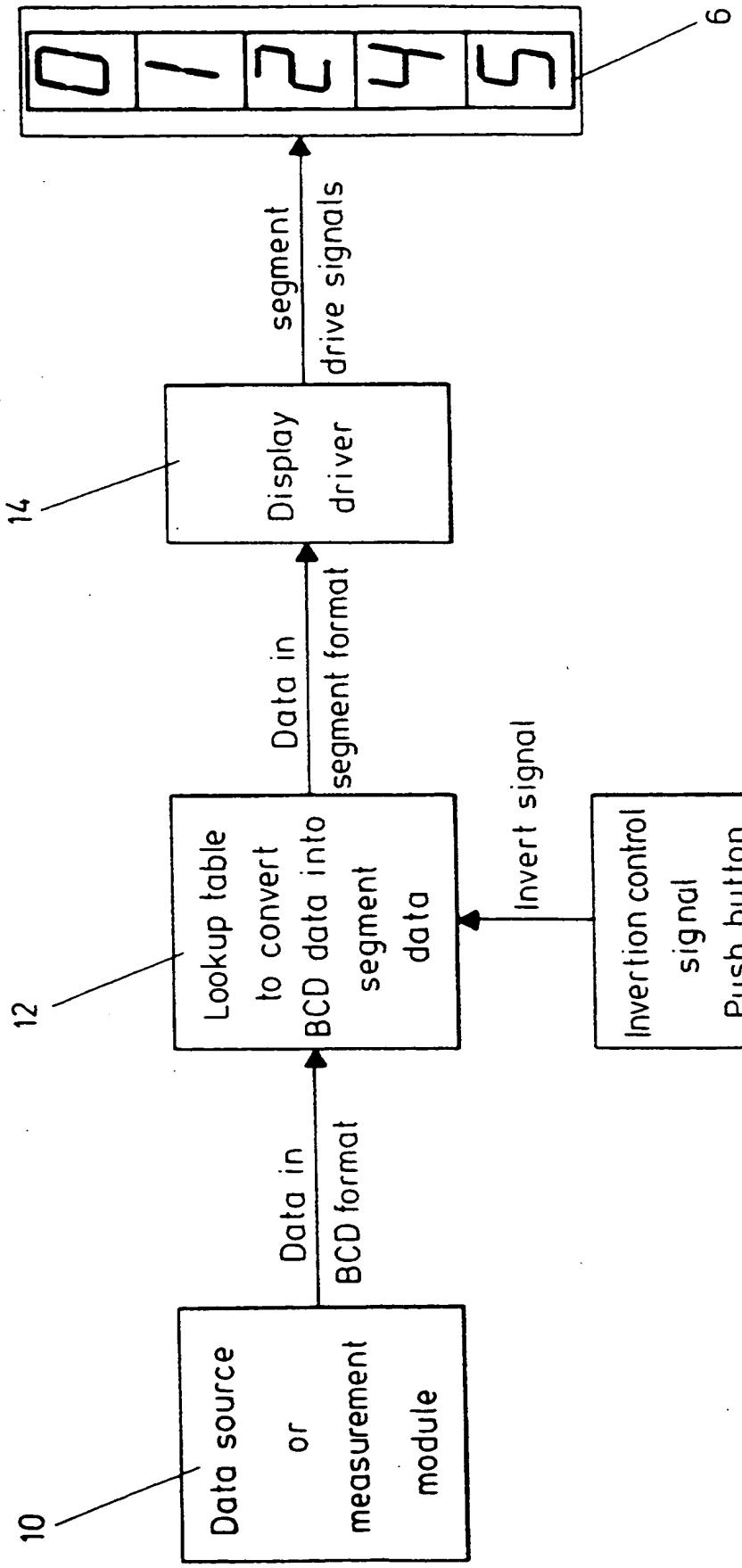

0 1 2 4 5
6
segment drive signals
14
Display driver
Data in segment format
12
Lookup table to convert BCD data into segment data
Invert signal
Invertion control signal Push button
16
Data in BCD format
10
Data source or measurement module

FIG. 3

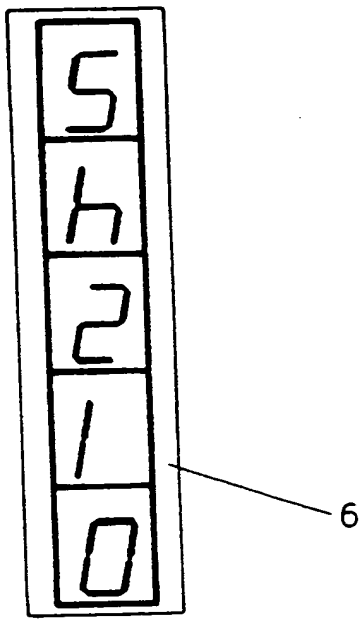


FIG. 3A

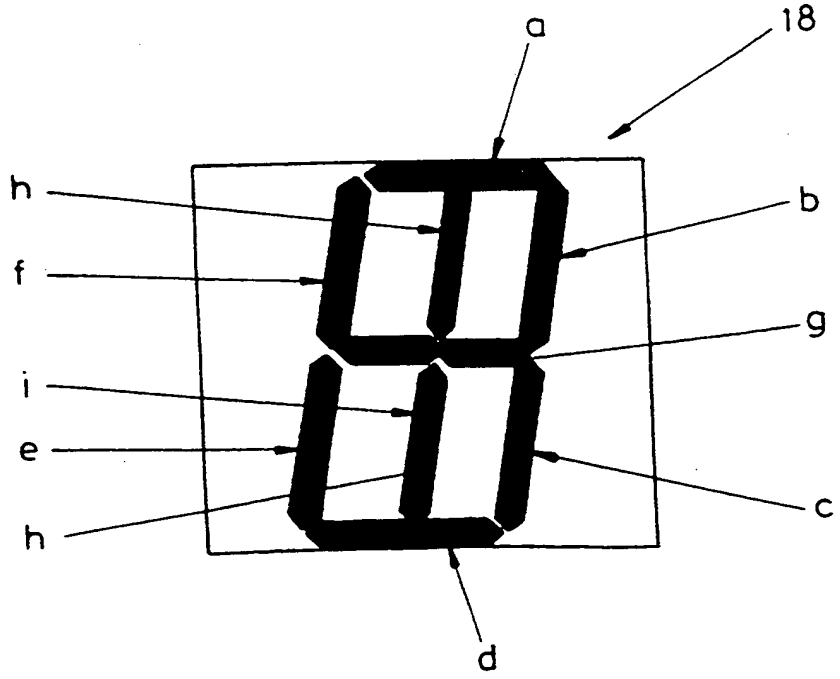


FIG. 4

Suitably, all of the characters are vertically spaced from each other.

In a further aspect of the invention, there is provided a measuring apparatus comprising a display device according to any preceding aspect of the invention.

Suitably, the apparatus is suitably sized to be hand-held.

Suitably, the apparatus comprises means for determining a physical quantity and a converter (suitably an analogue to digital converter) for converting the determined value into a suitable format, eg binary. Suitably, means are provided for providing a signal in binary coded decimal format.

Suitably, the device comprises a conversion means including a look up table to convert input data to segment data. Suitably, there is a first look up table to represent characters in a first orientation and a second look up table to represent characters in a second orientation.

Suitably, the apparatus comprises means for generating an inversion control signal operative to determine from which look up table of the first and second look up tables the conversion means accesses to generate segment data.

The invention includes within its scope a method of operating a device or apparatus of a preceding aspect of the invention.

According to the present invention in a second aspect, there is provided a segmented display device comprising a segmented display in the configuration of a numeral eight having two opposed pairs of generally vertical segments and at least one further segment located between one pair of generally vertical segments.

Such an arrangement can provide extra legibility for a vertical display.

Suitably, there is another segment located between the other pair of generally vertical segments or the at least one further segment extends between the other pair of generally vertical segments.

Suitably, the at least one further segment is a generally vertical segment.

Suitably, the at least one further segment is located substantially centrally in relation to the pairs of generally vertical segments it is disposed between.

The second aspect of the invention may include features from the third aspect of the invention.

According to the present invention in a third aspect, there is provided a display device comprising a plurality of characters, at least two characters being vertically spaced from one another when the device is in its normal orientation to be read.

A vertical display can be integrated more easily into a hand-held device.

display means for displaying at least one character in a first orientation and means for controllably changing the orientation of the displayed character relative to the display to a predetermined second orientation.

This has the advantage that as the orientation of the display changes the orientation of the displayed character(s) can change correspondingly to maintain legibility.

Suitably, the character display means can display a plurality of characters in a line. Normally, the characters will be alphanumeric characters and most commonly numeric characters 0 - 9.

Suitably, the second orientation is rotated relative to the first orientation, normally by a multiple of 90° and preferably by 180°.

Suitably, the orientation changing means comprises a switch operable to generate an inversion signal accordingly to which the displayed character is changed to a second orientation. Suitably, the switch is manually operable. Alternatively, the switch is computer controlled or means are provided to operate the switch according to the orientation of the display. The operating means may comprise a tilt switch.

Suitably, the display comprises a liquid crystal display. Preferably, the device is for a hand-held apparatus.

The first aspect of the invention may further comprise one or more of the features of the second or third aspects of the invention.

IMPROVEMENTS IN AND RELATING TO DISPLAY DEVICES AND MEASURING APPARATUS

Field of the Invention

The present invention relates to display devices and measuring apparatus, especially, though not exclusively, hand-held measuring devices.

Background to the Invention

Measuring apparatus such as tachometers, electronic rules, thermometers etc conveniently are hand-held for portability. Such apparatus needs to be used in a variety of orientations. Normally such apparatus include a liquid crystal or other numeric display. Known apparatus present various problems.

Notably, a horizontal alphanumeric display on such apparatus creates unwanted design restrictions, forces designs into shapes for the apparatus lacking ergonomic features and can make the apparatus difficult to use in certain situations. Also, as the orientation of the apparatus is changed the display can become difficult to read, especially if the display is being updated frequently.

It is an aim of preferred embodiments of the present invention to obviate or overcome at least one disadvantage of the prior art, whether referred to herein or otherwise.

Summary of the Invention

According to the present invention in a first aspect, there is provided a display device comprising a character

comprises a look-up table, suitably a Read Only Memory to generate segment data corresponding to the decimal number to be displayed and the inversion state of the display 6 according to the inversion signal. That is a first look up table can be used for forming numbers from top to bottom and a second look up table for forming numbers bottom to top. Figure 3A shows the display with the number shown in Figure 3, inverted.

Although in this embodiment the inversion signal is generated by a manual switch, it could be generated from a tilt switch according to the orientation of the apparatus, or from an external source according to operational requirements.

In this embodiment the characters are displayed reorientated through 180°. However, other reorientations could be generated. For instance, a 90° reorientation could be achieved by splitting in half segments "a" and "d" of a seven segment display.

As an alternative to using software to change the characters of display 6 to reorient the displayed characters, a hard wired option could be used in which the display signal lines are switched.

Referring to Figure 4 of the drawings that follow, there is shown a nine-segment display 18 for displaying decimal numerics for the present invention. The display 16 comprises the usual seven segment display with segments a-g forming a numeral "8". In addition a further segment "h" is provided parallel to segments b, c, e and f extending from segment a to segment d. The additional segment h is located centrally between the two vertical sides of the display 18 formed by segments b, c, e and f.

In use, the additional segment h can be used as a central numeral "1" (see Figure 3) so that when the display is inverted it does not appear to have switched sides. It has also been found experimentally and surprisingly that the centrally located numeral "1" is easier to read when viewed by the user than would be the case if it were at one side or the other of the display, especially in orientations away from the vertical.

Alternatively, the additional segment h can be half the length shown and a further segment i provided as the other half of previous additional segment for greater variation of character display options.

Whatever the location of the numerals, there can be a decimal point provided for all orientations to ensure the full range of numbers required can be displayed.

The reader's attention is directed to all papers and documents which are filed concurrently with or previous to this specification in connection with this application and which are open to public inspection with this specification, and the contents of all such papers and documents are incorporated herein by reference.

All of the features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or all of the steps of any method or process so disclosed, may be combined in any combination, except combinations where at least some of such features and/or steps are mutually exclusive.

Each feature disclosed in this specification (including any accompanying claims, abstract and drawings), may be replaced by alternative features serving

The display 6 is orientated vertically such that each number lies vertically above and/or beneath another of the numbers in the display 6. In this case the display 6 shows the number "87910". In Figure 2 of the drawings that follow the displayed number "87910" is inverted relative to the display 6 in Figure 1. The display 6 is inverted according to operation of the switch 8.

The apparatus 2 can be used in any orientation as required to make its measurement.

By operating the switch 8 to re-orient the characters in the display 6 relative to the display 6 itself, the user can maintain the legibility of the displayed characters of the display apparatus 2 as the apparatus itself is reorientated.

The mode of operation and function for achieving the display re-orientation feature is shown in Figures 3 and 4 of the drawings that follow.

Referring to Figure 3 of the drawings that follow, there is shown a functional arrangement for operation of the display 6. The measuring apparatus 2 generates from measuring means 10 a signal in binary coded decimal (BCD) format output to a data conversion means 12. The data conversion means 12 converts BCD data into segment data and outputs the segment data to a display driver 14. The display driver 14 drives display 6 to generate the required character display.

If it is desired to invert the displayed characters, then upon activation of the switch 8 an inversion control signal generator 16 generates an inversion signal output to data conversion means 12. The data conversion means 12

Brief Description of the Drawings

The present invention will now be described, by way of example only, with reference to the drawings that follow; in which:

Figure 1 is a perspective illustration of a measuring apparatus according to the present invention, with the display in a first orientation.

Figure 2 is a front elevation of the apparatus shown in Figure 1, with the display in a second orientation.

Figure 3 is a functional block diagram of an arrangement according to the present invention with the display in a first orientation.

Figure 3A shows the display of Figure 3 in a second orientation.

Figure 4 is an enlarged front view of a display device according to the present invention.

Description of the Preferred Embodiments

Referring to Figures 1 and 2 of the drawings that follow, there is shown a hand-held measuring apparatus 2 which, in this case, is a tachometer. The apparatus 2 comprises a housing body 4, a liquid crystal display panel 6 and a switch 8. The way in which the apparatus 2 carries out its measurement is immaterial to the present invention and so will not be elaborated upon here. It is however significant that the apparatus generates a signal that it is desired to represent numerically in display 6.

the same, equivalent or similar purpose, unless expressly stated otherwise. Thus, unless expressly stated otherwise, each feature disclosed is one example only of a generic series of equivalent or similar features.

The invention is not restricted to the details of the foregoing embodiment(s). The invention extends to any novel one, or any novel combination, of the features disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel combination, of the steps of any method or process so disclosed.

CLAIMS

1. A display device comprising a character display means for displaying at least one character in a first orientation and means for controllably changing the orientation of the displayed character relative to the display to a predetermined second orientation.

2. A display device according to Claim 1, in which the character display means can display a plurality of characters in a line.

3. A display device according to Claim 2, in which the characters are alphanumeric characters and most commonly numeric characters 0 - 9.

4. A display device according to any preceding Claim, in which the second orientation is rotated relative to the first orientation.

5. A display device according to Claim 4, in which the second orientation is rotated by a multiple of 90°.

6. A display device according to Claim 4, in which the second orientation is rotated by 180°.

7. A display device according to any preceding Claim, in which the orientation changing means comprises a switch operable to generate an inversion signal accordingly to which the displayed character is changed to a second orientation.

8. A display device according to Claim 7, in which the switch is manually operable.

9. A display device according to Claim 7, in which the switch is computer controlled.

10. A display device according to Claim 7, in which means are provided to operate the switch according to the orientation of the display.

11. A display device according to Claim 10, in which the operating means may comprise a tilt switch.

12. A display device according to any preceding Claim, in which the display comprises a liquid crystal display.

13. A display device according to any preceding Claim, in which the device is for a hand-held apparatus.

14. A display device according to any preceding Claim, in which the device comprises a segmented display in the configuration of a numeral eight having two opposed pairs of generally vertical segments and at least one further segment located between one pair of generally vertical segments.

15. A display device according to Claim 14, in which there is another segment located between the other pair of generally vertical segments or the at least one further segment extends between the other pair of generally vertical segments.

16. A display device according to Claims 14 or 15, in which the at least one further segment is a generally vertical segment.

17. A display device according to any one of Claims 14-16, in which the at least one further segment is located

substantially centrally in relation to the pairs of generally vertical segments it is disposed between.

18. A display device according to any preceding Claim, in which the display device comprises a plurality of characters, at least two characters being vertically spaced from one another when the device is in its normal orientation to be read.

19. A display device according to Claim 18, in which all of the characters are vertically spaced from each other.

20. A segmented display device comprising a segmented display in the configuration of a numeral eight having two opposed pairs of generally vertical segments and at least one further segment located between one pair of generally vertical segments.

21. A segmented display device according to Claim 20, in which there is another segment located between the other pair of generally vertical segments or the at least one further segment extends between the other pair of generally vertical segments.

22. A segmented display device acceding to Claim 20 or 21, in which the at least one further segment is a generally vertical segment.

23. A segmented display device according to any one of Claims 20-22, in which the at least one further segment is located substantially centrally in relation to the pairs of generally vertical segments it is disposed between.

24. A segmented display device according to any one of Claims 20-23, in which the display device comprises a

plurality of characters, at least two characters being vertically spaced from one another when the device is in its normal orientation to be read.

25. A segmented display device according to Claim 24, in which all of the characters are vertically spaced from each other.

26. A display device comprising a plurality of characters, at least two characters being vertically spaced from one another when the device is in its normal orientation to be read.

27. A display device according to Claim 26, in which all of the characters are vertically spaced from each other.

28. A measuring apparatus comprising a display device according to any one of Claims 1-27.

29. A measuring apparatus according to Claim 28, in which the apparatus is suitably sized to be hand-held.

30. A measuring apparatus according to Claim 28 or 29, in which the apparatus comprises means for determining a physical quantity and a converter for converting the determined value into a suitable format, eg binary.

31. A measuring apparatus according to Claim 30, in which means are provided for providing a signal in binary coded decimal format.

32. A measuring apparatus according to any one of Claims 28-31, in which the device comprises a conversion means including a look up table to convert input data to segment data.

33. A measuring apparatus according to Claim 32, in which there is a first look up table to represent characters in a first orientation and a second look up table to represent characters in a second orientation.

34. A measuring apparatus according to any one of Claims 28-32, in which the apparatus comprises means for generating an inversion control signal operative to determine from which look up table of the first and second look up tables the conversion means accesses to generate segment data.

35. A method of operating a device of any one of Claims 1-27 or apparatus of any one of Claims 1-27.

The Patent Office

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Application No: GB 9619171.3
Claims searched: 1 to 19

Examiner: Grant Bedford
Date of search: 19 January 1998

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.P): G5C (CHA CHF)

Int Cl (Ed.6): G01K 1/00 1/06 13/00, G01P 1/08, G04C 21/00, G09F 9/00 9/30 9/33 9/35, G09G 3/20, G12B 11/00

Other: Online: WPI EPODOC

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	GB 2228127 A	(QUDOS) See whole document.	1 to 13
X	GB 2216703 A	(NEC) See whole document.	1 to 13, 18 and 19
X	GB 2191323 A	(NEC) See figure 7, and page 1 line 70 to page 3 line 102.	1 to 13
X	GB 1459325 A	(HEWLETT-PACKARD) See figure 1, and page 1 lines 49 to page 2 line 25	1 to 13
X	EP 0590493 A1	(SIEMENS) See whole document.	1 to 13
A	EP 0504491 A1	(BOSCH)	1 to 19
X	US 5640627 A	(ASAHI KOGAKU KOGYO) See column 1 lines 30 to 59 and claims.	1 to 13
X	Patent abstracts of Japan Vol. 16, No. 404, P1410 page 27 & JP4134493 (RICOH DENSHI) See abstract.		1 to 13

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